

WHAT IS CLAIMED IS:

1. A lead frame, comprising:
a frame; and
5 a plurality of inner leads, extending inward from the frame,
wherein the inner lead includes a protruded portion provided on a
surface of its outer portion, the protruded portion protrudes in a thickness
direction, and a step portion is formed in a side portion of the protruded
portion.
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2. The lead frame according to claim 1, wherein the step portion is
formed as a portion with two steps or more.
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3. A method of producing a lead frame, comprising:
forming a structure including a frame and a plurality of inner leads
extending inward from the frame; half-etching or pressing a part of a surface
of the inner lead to form a protruded portion on the surface; and then
carrying out half-etching or pressing again from surroundings of a surface of
the protruded portion to form a step portion in a side portion of the protruded
20 portion.
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4. A resin-encapsulated semiconductor device, comprising:
a semiconductor chip having a group of electrodes;
a plurality of inner leads that are arranged along a periphery of the
semiconductor chip and are connected to the group of electrodes of the
semiconductor chip, respectively; and
an encapsulating resin that encapsulates a connection part located
between the semiconductor chip and the inner leads, with a part of each of
the inner leads being exposed from the encapsulating resin to form an
30 external terminal,
wherein the inner lead includes a protruded portion provided on a
surface thereof on an outer side relative to the periphery of the semiconductor
chip, the protruded portion protruding in a thickness direction with a step
portion formed in a side portion of the protruded portion,
35 the group of electrodes of the semiconductor chip is connected to
surfaces of inner portions of the inner leads located on an inner side relative
to their protruded portions, through electroconductive bumps, respectively,

and

the encapsulating resin encapsulates the semiconductor chip and the electroconductive bumps and is formed to expose surfaces of the protruded portions.

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5. The resin-encapsulated semiconductor device according to claim 4, wherein the semiconductor chip includes a first semiconductor chip and a second semiconductor chip that is stacked on a surface of the first semiconductor chip and has a smaller size than that of the first semiconductor chip,

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the protruded portions of the plurality of inner leads are located on an outer side relative to a periphery of the first semiconductor chip,

a first group of electrodes of the first semiconductor chip is connected with the surfaces of the inner portions of the inner leads located on the inner side relative to their protruded portions, through first electroconductive bumps, respectively,

the second semiconductor chip is disposed within a region surrounded by inner ends of the plurality of inner leads and is connected electrically with a second group of electrodes of the first semiconductor chip through second electroconductive bumps, and

the encapsulating resin encapsulates surfaces of the first and second semiconductor chips and the first and second electroconductive bumps.

6. The resin-encapsulated semiconductor device according to claim 4,

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wherein the surfaces of the protruded portions and an outer face of the encapsulating resin are substantially in the same plane.

7. The resin-encapsulated semiconductor device according to claim 4, wherein a back face of the first semiconductor chip and an outer face of the encapsulating resin are substantially in the same plane.

8. The resin-encapsulated semiconductor device according to claim 4, wherein back faces of the inner leads and an outer face of the encapsulating resin are substantially in the same plane.

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9. The resin-encapsulated semiconductor device according to claim 4, wherein the inner lead is tilted gradually to a side on which the protruded

portion is formed, toward an inner end of the inner lead.

10. The resin-encapsulated semiconductor device according to claim 4, wherein ball electrodes are formed on the protruded portions.

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11. The resin-encapsulated semiconductor device according to claim 4, wherein an insulating thin film is formed on a part of the surface of the protruded portions of the inner leads, and a part of the surface of the protruded portion where the insulating thin film has not been formed

10 functions as an external terminal.

12. A resin-encapsulated semiconductor device, wherein a plurality of resin-encapsulated semiconductor devices according to claim 4 are stacked on top of each other, and in adjacent pairs, back faces of inner leads of one are 15 connected electrically with surfaces of protruded portions of an other.

13. The resin-encapsulated semiconductor device according to claim 12, wherein at least three resin-encapsulated semiconductor devices are stacked on top of each other.

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14. A method of producing a resin-encapsulated semiconductor device, using a lead frame that includes a frame and a plurality of inner leads that extend inward from the frame, the inner lead having a protruded portion provided on a surface of its outer portion, and the protruded portion 25 protruding in a thickness direction and being provided with a step portion formed in its side portion, the method comprising:

forming first electroconductive bumps on surfaces of the inner leads on an inner side relative to their protruded portions;

stacking a second semiconductor chip having a smaller size than that 30 of a first semiconductor chip, on a surface of the first semiconductor chip, and electrically connecting a first group of electrodes of the first semiconductor chip with a group of electrodes of the second semiconductor chip through second electroconductive bumps;

electrically connecting the first electroconductive bumps with a 35 second group of electrodes of the first semiconductor chip formed on an outer side relative to a region of the first semiconductor chip to which the second semiconductor chip has been connected; and

5 encapsulating a region including surfaces of the first and second semiconductor chips and the first and second electroconductive bumps with an encapsulating resin with surfaces of the protruded portions being substantially in the same plane as an outer face of the encapsulating resin and being exposed from the encapsulating resin.

10 15. The method of producing a resin-encapsulated semiconductor device according to claim 14, further comprising, after encapsulating the region, cutting off a portion sticking out from the encapsulating resin of the inner leads to separate a structure encapsulated with the resin from the frame.

15 16. The method of producing a resin-encapsulated semiconductor device according to claim 14, wherein in encapsulating the region, the encapsulating resin is fed with a resin sheet being in close contact at least with the protruded portions.

20 17. A method of producing a resin-encapsulated semiconductor device, using a lead frame that includes a frame and a plurality of inner leads that extend inward from the frame, the inner lead having a protruded portion provided on a surface of its outer portion, and the protruded portion protruding in a thickness direction and being provided with a step portion formed in its side portion, the method comprising:

 forming first electroconductive bumps on surfaces of the inner leads on an inner side relative to their protruded portions;

25 stacking a second semiconductor chip having a smaller size than that of a first semiconductor chip, on a surface of the first semiconductor chip, and electrically connecting a first group of electrodes of the first semiconductor chip with a group of electrodes of the second semiconductor chip through second electroconductive bumps;

30 electrically connecting the first electroconductive bumps with a second group of electrodes of the first semiconductor chip formed on an outer side relative to a region of the first semiconductor chip to which the second semiconductor chip has been connected; and

35 encapsulating a region including surfaces of the first and second semiconductor chips and the first and second electroconductive bumps with an encapsulating resin.

18. The method of producing a resin-encapsulated semiconductor device according to claim 17, further comprising, after encapsulating the region, cutting off a portion sticking out from the encapsulating resin of the inner leads to separate a structure encapsulated with the resin from the frame.

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19. The method of producing a resin-encapsulated semiconductor device according to claim 17, wherein in encapsulating the region, the encapsulating resin is fed with a resin sheet being in close contact at least with the protruded portions.

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